

## Assessment Schedule – 2009

## Biology: Describe biological ideas relating to how humans use and are affected by micro-organisms (90168)

## Evidence Statement

Question	Achievement	Achievement with Merit	Achievement with Excellence
ONE	<p><b>Named organism and food produced AND describes how food produced OR conditions required, eg:</b></p> <p><b>Named:</b>  <u>Bread</u>  Organism: Fungi – yeast.</p> <p><u>Cheese</u>  Organism: Bacteria and / or fungi.</p> <p><u>Wine / Beer (alcohol accepted)</u>  Organism: Fungi – yeast.</p> <p><u>Yoghurt</u>  Organism: Bacteria (lactobacillus).</p> <p><u>Ginger beer</u>  Organism: Yeast.</p> <p><b>AND How OR conditions</b>  <b>How:</b>  <u>Bread</u>  Carbon dioxide (CO<sub>2</sub>) produced</p> <p><u>Cheese</u>  Bacteria releases CO<sub>2</sub>.  OR  Bacteria excrete waste products / lactic acid  OR  Fungi ferment and excrete waste.</p> <p><u>Wine / Beer</u>  Forms alcohol (ethanol) and CO<sub>2</sub>  OR  Fermentation equation:  Glucose → CO<sub>2</sub> + alcohol</p> <p><u>Yoghurt</u>  Produces lactic acid curdles milk.</p> <p><u>Ginger beer</u>  CO<sub>2</sub> produced forms bubbles</p> <p>OR  <b>Conditions</b>  Both fungi and bacteria require warmth space and moisture (at least TWO).  OR  May comment on temperature or pH, oxygen availability moisture</p>	<p><b>As for Achievement and an explanation of how named food produced OR how conditions influence food production, eg:</b>  <u>Bread</u>  CO<sub>2</sub> produced by anaerobic <b>respiration</b> of yeast, makes bread rise (bubbles).</p> <p><u>Cheese</u>  Produced by fermentation process which occurs as bacteria <b>respire</b> releasing CO<sub>2</sub>.  OR  Bacteria excrete waste products during <b>respiration</b> which give cheese flavour.  OR  Excreted waste lactic acid produced during <b>respiration</b> causes milk to curdle.</p> <p><u>Wine / Beer</u>  Alcohol produced by fermentation process, which occurs as yeast <b>respire</b> anerobically (without oxygen).  OR  CO<sub>2</sub> produced by anaerobic <b>respiration</b> of yeast, gives alcohol fizz (bubbles).</p> <p><u>Yoghurt</u>  Lactic acid produced during <b>respiration</b> lowers pH of milk, causing it to curdle and forming curds.</p> <p>OR</p> <p><b>Conditions</b>  Conditions such as temperature and pH vary during production of foods using microorganisms. This creates <b>different</b> flavours, textures and results in food variety.</p>	<p><b>As for Merit and discussion LINKS process of fermentation to the micro-organisms' survival (death), eg:</b>  Fermentation is an important process that provides the microorganism with <b>energy</b> from carbohydrates under <b>anaerobic conditions</b> to <b>survive and / or reproduce / or grow</b>.</p> <p>OR</p> <p>A <b>waste product</b> of fermentation is alcohol and this is <b>toxic</b> when in too <b>high a concentration</b> and yeast begin to <b>die</b>.</p> <p><b>Eg:</b>  <b>Cheese</b> can be manufactured using both <b>fungi</b> and <b>bacteria</b>. When bacteria are used (lactobacillus), <b>milk is fermented</b> during <b>anaerobic respiration</b> (without oxygen) which causes the pH of the milk to drop, resulting in solid curds forming. By <b>varying conditions</b> such as temperature, and using different microorganisms, eg bacteria or fungi, different types of cheese can be produced. <b>This provides the organism with the necessary nutrients to survive and reproduce.</b></p> <p>OR</p> <p><b>Yeast</b> is a fungus that is used to produce <b>alcoholic drinks</b> such as beer and wine as a consequence of <b>anaerobic respiration</b>. In anaerobic conditions (<b>without oxygen</b>), sugars from fruit, eg grapes, ferment to form alcohol (ethanol) and carbon dioxide. The alcohol adds to the drink flavour and the carbon dioxide gives it bubbles. <b>Energy is produced which allows the organism to survive.</b></p> <p>OR</p> <p><b>Bacteria</b> such as <i>Lactobacillus</i> or <i>Streptococcus</i> are used to make</p>

	(at least TWO).		<p><b>yoghurt by fermenting milk.</b> The milk is incubated with the bacteria added, <b>which remove oxygen</b> and create <b>anaerobic conditions</b>.</p> <p><b>Lactic acid</b> is then produced as a <b>waste product</b> of the bacteria's anaerobic respiration. It causes the pH of the milk to drop and results in the curdling of the milk protein casein, which produces the yoghurt texture. Flavour is created by adding sugar and fruit.</p> <p><b>Respiration provides the energy the bacteria need to survive and reproduce.</b></p>
TWO	<p><b>Describes ONE from each of conditions for bacterial growth AND from bacterial reproduction AND reducing risk of food poisoning.</b></p> <p>Eg: <b>Conditions</b> Warm, moist, nutrients / food available, space moisture (at least TWO).</p> <p>OR Limiting factors, space, toxins produced, run out of food moisture (at least TWO).</p> <p>AND</p> <p><b>Reproduction</b> Binary fission / asexual / mitosis (or appropriate description or diagram).</p> <p>AND</p> <p><b>Reduce risks</b> Cook chicken well. (not sterilise)</p> <p>OR</p> <p>Refrigerate (4°C or below) or freeze immediately if not being used.</p> <p>OR</p> <p>Wash hands.</p>	<p><b>As for achievement AND provided BOTH favourable and limiting conditions and ONE other explanation.</b></p> <p>Eg: <b>Conditions</b> <b>Any two from warm / moist / favourable optimum conditions</b></p> <p>AND Population declines (bacteria die) due to accumulation of <b>limiting factors</b>, eg decreased space, decreased nutrients / food, increased waste / toxins.</p> <p>AND</p> <p><b>Reproduction, eg:</b> Binary fission produces two <b>identical</b> daughter cells in <b>20 minutes (quickly)</b> when <b>conditions are ideal</b> (Optimum conditions).</p> <p>OR Binary fission is a form of <b>asexual reproduction</b> and can increase numbers of bacteria very <b>quickly</b> when <b>conditions are ideal</b> (Optimum conditions).</p> <p>OR</p> <p><b>Reduce Risk, eg:</b> Cooking chicken well kill all the bacteria present so will <b>not be able to reproduce</b></p> <p>OR Cleanliness and good hand hygiene after the toilet or before handling food will help to <b>prevent transfer of bacteria</b></p>	<p><b>Discussion includes condition, reproduction and reduction of risk and LINKS to graph.</b></p> <p>Eg: Bacteria need <b>warm, moist conditions</b> that provide them with the required <b>nutrients to survive</b>. Chicken naturally has bacteria, causing food poisoning in small numbers. These pathogenic bacteria <b>reproduce quickly</b>, using <b>binary fission</b> if conditions are ideal, such as being left out at room temperature for prolonged periods.</p> <p>The graph shows that bacterial numbers are <b>initially slow</b> then numbers of bacteria <b>grow rapidly</b> (exponential growth) when <b>conditions are ideal</b>. However, exponential growth <b>cannot continue indefinitely</b>. <b>Numbers will eventually decline</b> when nutrients are used up, less space becomes available, or there is a build-up of waste products produced by the bacteria. These are referred to as <b>limiting factors</b>.</p> <p>By <b>refrigerating</b> the chicken in the <b>low temperature slows down the rate of reproduction</b> because the conditions are not ideal.</p>

THREE	<p><b>Describe what an antibiotic is or its function AND one other point.</b></p> <p>Eg: <u>Antibiotic</u>: substance that is produced by fungi</p> <p>OR</p> <p>Substance (drug, chemical, medication) which inhibits growth of <b>bacteria</b>. (Not virus or microbes / microorganisms)</p> <p>OR</p> <p>Used by humans to treat infection and disease / illness.</p> <p>AND one from: <u>Problems</u> Bacteria can become resistant (immune).</p> <p>OR</p> <p>Bacteria change quickly (mutate).</p> <p>OR</p> <p>Patients don't finish their course of antibiotics.</p> <p>OR</p> <p>Kill helpful bacteria.</p> <p>OR</p> <p><u>Viral Infections</u> Antibiotics don't work on viruses</p> <p>OR</p> <p>Viruses change (mutate) very quickly.</p> <p>OR</p> <p>Viruses require a host cell.</p>	<p><b>Achievement plus, explains any ONE of: function / problems / viral.</b></p> <p>Eg:</p> <p><u>Function</u> Interfere with the chemical processes / metabolism of bacteria, however non-toxic to humans.</p> <p>OR</p> <p><b>Interfere</b> with bacteria cell wall so cannot reproduce.</p> <p>OR</p> <p><u>Problems</u> Bacterial populations are able to <b>transfer genetic material</b> among them, so resistance can be transferred to other bacteria (conjugation).</p> <p>OR</p> <p>Problem made worse because some <b>doctors prescribe</b> antibiotics for <b>trivial infections / incorrectly</b>.</p> <p>OR</p> <p>Patients don't complete course of antibiotics so more <b>resistant</b> bacteria can reproduce <b>resistant offspring</b> quickly.</p> <p>OR</p> <p>Kills good bacteria making patient more vulnerable to infection.</p> <p><b>OR</b></p> <p><u>Viral infection</u> Antibiotics are useless against viruses because viruses are non-living and have no chemical processes / metabolism.</p>	<p><b>Any TWO merit points discussed:</b></p> <p>Eg:</p> <p>Extensive use of antibiotics encourages populations of <b>antibiotic-resistant bacteria</b>. Unnecessary prescribing of antibiotics increases exposure of a large range of bacteria to antibiotics, and thus increases the development of resistant bacteria.</p> <p>Over the years, bacteria have become <b>resistant to antibiotics</b>. This has occurred because of <b>mutations</b> that happen occasionally in bacteria, giving them a <b>higher survival rate</b> against the effects of antibiotics and due to natural variation among bacteria, which means that some will be resistant to the antibiotic, and <b>so they will survive</b> the exposure to the antibiotic. They will then reproduce, and thus over time, <b>all the bacteria in the population will be resistant</b> to that antibiotic, so it will no longer be effective.</p> <p>Antibiotics are useless against viruses because <b>viruses are non-living</b>. They have <b>no chemical processes</b> (metabolism). They reproduce using the <b>host (human) cell</b> and because antibiotics are non-toxic to humans, the host cell is not affected, as they interfere with the bacteria's metabolism or the cell wall. Thus they are ineffective against viruses. They may cause more harm than good as they will <b>kill helpful bacteria</b>.</p>
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### Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
2 A	2 M	2 E OR 1 E + 2 M